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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER
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ART UNIT	PAPER NUMBER
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DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

## Office Action Summary

Application No.

09/270,606

Applicant(s)

EVANS, DAVID RUSSELL

Examiner

Matthew A. Anderson

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02 May 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other

## DETAILED ACTION

### *Claim Rejections - 35 U.S.C. 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kodera et al. (US 5,445,996) in view of Grover et al. and further in view of Burke et al. (US 5,934,978).

Kodera et al. discloses a method for planarizing an insulating film using an aqueous slurry containing cerium oxide. In Fig. 22, the polishing rate of certain interconnect features (see col. 24 lines 45+) overlaid with SiO<sub>2</sub> insulation is described. The recesses between the raised portions were seen to be polished at near a zero rate until the raised portions were reduced in height almost to that of the recesses with no polishing. Then, both portions were polished at virtually an identical rate. The lack of a change in the slope of the graph indicates the raised portions were polished at essentially the blanket polishing rate. In col. 44 lines 3-11 the use of a surface active

agent is disclosed. Koderer et al. discloses the optimization of friction to cause a uniform polishing rate. It is obvious to those of ordinary skill in the art that the processing parameters such as abrasive concentration and pressure applied will affect the friction in a direct relationship.

Koderer et al. does not explicitly disclose the use of ethylene glycol in such a slurry.

Grover et al. discloses a method of chemical mechanical polishing (CMP) using a slurry containing cerium oxide (Col. 4 lines 40-45). The slurry also contains an additive (i.e. a modifier) comprised of a carboxylic acid. The method is disclosed as useful for STI (shallow trench isolation). STI is disclosed in Col. 1 lines 25-37 as follows: silicon nitride is deposited over a thermal oxide; a shallow trench is etched; a layer of oxide is deposited over the into the trench; the excess oxide is polished using CMP such that the surface is planar (i.e. the high spots are removed and the low spots are essentially untouched. In Col. 5 lines 60-63 the percentage of the metal oxide abrasive is disclosed as from about 2-25 % by weight. In Col. 7 lines 40-53 is described the methods of the enclosed Examples including the down force of 9 psi.

Burke et al. discloses in Cols. 3 and 4, lines 60+ and 1-9, respectively, the addition of a suspension agent which improves the colloidal behavior of the abrasive particles in deionized water and inhibits the coalescence of the particles. Ethylene glycol is disclosed as a suspension agent. In col. 4 lines 9-15, ceria (i.e. cerium oxide) is disclosed as the abrasive particles in the slurry. Those of ordinary skill in the art

know that the terms surface active agent or surfactant are equivalent to the term suspension agent.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the references cited because Koderia et al. discloses a CMP process where the ceria containing slurry polishes the high spots at a nearly constant rate while the low spots are virtually untouched, Grover et al. adds known process parameter data to the mix, and Burke et al. discloses the use of a suspension agent (ethylene glycol) which would increase solubility of the colloidal particles of ceria stay in the aqueous solution and not coalesce, and because such a combination would have been anticipated to produce this expected result.

In regard to claims 1, 10-11, 14, 16, 17 it would have been obvious to one of ordinary skill in the art at the time of the present invention to form a slurry containing ceria, use that ceria containing slurry to polish the high spots of a  $\text{SiO}_2$  structure at a nearly constant rate while the low spots are virtually untouched because such a method is described by Koderia et al. and such a method would have been anticipated to produce an expected result. The density of features to be polished is shown to not effect the polishing of the high structures as is seen in Fig. 32A-32B where the entire surface is planarized regardless of the density of the high structures.

In regard to claims 2-9, 12, 18, 19, it would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the process parameters of cerium oxide (ceria) concentration between 1%-50% weight and pressure

between 5-10 psi because these were known in the art (Grover et al.) and such optimization would have been achieved with only routine experimentation.

In reply to claims 4,7,8,15, 20, it would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the amount of ethylene glycol in such a slurry because the addition of ethylene glycol in a ceria-containing CMP slurry to affect the suspension and ultimately the polishing properties of the slurry was known, such optimization would have been anticipated to produce an expected result, and such optimization would have been achieved with only routine experimentation.

### ***Response to Arguments***

3. Applicant's arguments filed 5/02/01 have been fully considered but they are not persuasive.

4. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

5. The argument that the Koderia et al. reference teaches away from the present invention is not convincing. The known slurry is used at known pressures to planarize a uneven surface on a substrate. The optimization of friction to control rates of polishing was described by Koderia et al. The presence of a stopper layer does not preclude the

reference from suggesting the present invention especially in light of the comprising language therein.

6. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Burke et al. and Grover et al. suggest known process parameters for ceria slurry polishing and would have been obvious additions to the Koder et al. method.

7. The argument that the references combined do not suggest polishing high areas at a blanket polishing rate is not convincing in light of Figs 22-27 of Koder et al. The high structures are polished until they become level with the low surfaces and then the entire surface is polished at a rate essentially the same as that of the high structures (i.e. the high structure polishing rate is essentially the blanket rate).

### ***Conclusion***

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matt Anderson whose telephone number is (703)

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308-0086. The examiner can normally be reached on Monday-Thursday from 6:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are not successful, the examiner's supervisor, Benjamin Utech, can be reached at (703) 308-3836.

Any inquiry of a general nature can be directed to the group receptionist whose telephone number is (703) 308-0661.

MAA

July 12, 2001



ROBERT KUNEMUND  
PRIMARY EXAMINER